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Measurement and Verification Using Stipulated Savings Factors

6.1 Overview

Stipulated savings factor measurement and verification (M&V) techniques involve establishing the efficiency of a system before and after a retrofit by multiplying the difference by an agreed-upon or “stipulated” factor, such as operating hours or system load. These stipulated factors represent a project’s potential to generate savings based on engineering analysis and simple verification activities.

Stipulated savings factor M&V methods are appropriate only for projects in which the following apply for the baseline and post-installation case:

- Electrical demand is constant, or varies as a function of operating scenarios, e.g., damper position for baseline or motor speed for post-installation; the electrical demand for each operating scenario can be defined with spot measurements; and
- Operating hours as a function of operating scenario can be stipulated.

If the equipment involved in a project has a complex load profile and/or a complicated operating schedule, a different M&V method should be used.

Any Sponsor considering the use of stipulated savings factors not specified in this program should consult with Entergy prior to submitting an M&V plan.

The M&V method described here is based on Option A of the 1997 International Performance Measurement and Verification Protocol (IPMVP). Valuable insights on this method can be found in the IPMVP.

6.2 Data Types

Three general types of data may be needed to estimate energy savings with an M&V plan using stipulated savings factors:

- Stipulated values based on: manufacturer’s data, historical values, documented schedules from Energy Management Systems, operator’s logs, results from measures in similar facilities;
- Observations or inspections used to verify equipment type, nameplate data, counts, applications, and general operating characteristics; and
- Spot/short term metering may be used to determine power draw for different operating characteristics.

The types of data needed to verify energy savings for a specific project will depend on its complexity and the type of relevant stipulated data available. All stipulated factors must be clearly explained and supported by the Sponsor in the M&V plan. Note that there may be sizable differences between published equipment performance information and actual

operating data. Where discrepancies exist or are believed to exist, equipment performance parameters should be measured directly.

6.3 Documenting Baseline Operating Characteristics

To establish the baseline operating characteristics of the existing equipment, the following steps are taken:

1. The Sponsor conducts a pre-installation equipment survey.
2. Entergy and/or its contractor conducts a pre-installation inspection.
3. The Sponsor develops and verifies stipulated savings factors.

6.3.1 Pre-installation Equipment Survey

The Sponsor is required to conduct a pre-installation equipment survey to be submitted as part of the Final Application. The purpose of the survey is to inventory all existing equipment to be affected by the project, and to propose equipment to be installed. For each piece of existing equipment, the survey should list (as applicable): location, manufacturer, model number, rated capacity, energy use factors (such as voltage, rated amperage, fixture wattage), nominal efficiency, the load served, and any other identifiers that affect system energy consumption.

6.3.2 Pre-installation Inspection

Entergy or its contractor will conduct a pre-installation inspection to verify that the Sponsor has properly documented the baseline equipment in the survey, and that the stipulated savings values in the M&V plan are appropriate. If significant errors are found, Entergy will inform the Sponsor that the submitted survey (which is a part of the Final Application) must be corrected and resubmitted.

6.3.3 Development and Verification of Stipulated Savings Factors

The Sponsor may use a variety of sources in the development of stipulated savings factors, including manufacturer's data, historical values, documented schedules from energy management systems, operator's logs, and results from measures in similar facilities. The pre-installation equipment inspection will be used to confirm that the stipulated factors proposed in the M&V plan are appropriate for the equipment type, application, and general operating characteristics of the project. Spot- or short-term monitoring may be required to confirm the applicability of a stipulated savings factor to a specific project.

Entergy must approve all stipulated savings factors, so all data sources, methodologies, and assumptions used in their development by the Sponsor must be clearly outlined in the M&V plan.

6.4 Compliance with Energy Standards

When using stipulated savings methods, the M&V plan should document how baseline consumption values will be adjusted to comply with minimum state and federal energy standards with respect to the following:

- Baseline equipment should meet prescriptive efficiency standards requirements for affected equipment (e.g., ASHRAE Standard 90.1);
- The baseline does not have to comply with performance compliance methods that require the project site to meet an energy budget; and
- Demand and energy savings should be calculated with the incorporation of minimum state and federal energy efficiency standards or codes into the determination of baseline energy use.

6.5 Documenting Post-Installation Operating Characteristics

To establish the post-installation operating characteristics of the newly installed equipment, the following steps should be taken:

1. The Sponsor conducts a post-installation equipment survey.
2. Entergy or its contractor conducts a post-installation inspection.
3. The Sponsor verifies stipulated savings factors using data from the installed system.

6.5.1 *Post-installation Equipment Survey*

The Sponsor is required to conduct a post-installation equipment survey to be submitted as part of the Installation Report. The purpose of this equipment survey is to document the equipment that was actually installed as part of a project. For each piece of equipment, the survey should list (as applicable): location, manufacturer, model number, rated capacity, energy use factors (such as voltage, rated amperage, fixture wattage), nominal efficiency, the load served, and any independent variables that affect system energy consumption.

6.5.2 *Post-installation Inspection*

Entergy or its contractor will conduct a post-installation inspection to verify that the Sponsor has properly documented the installed equipment and that the stipulated savings values in the M&V plan are appropriate. After the inspection, Entergy will either accept or reject the Installation Report and the proposed stipulated savings factors based on the inspection results and project review.

6.5.3 *Verification of Stipulated Savings Factors*

The post-installation inspection results will be used to verify that the stipulated factors proposed in the M&V plan are still appropriate for the installed equipment and its general operating characteristics. Spot- or short-term post-installation monitoring may be required to confirm their applicability to a specific project.

6.5.4 *Calculation of Demand and Energy Savings*

Once the installed equipment has been verified to be operating properly and the proposed stipulated savings factors have been approved by Entergy, the Sponsor must calculate the demand and energy savings generated by the project. The best approach for calculating the project's savings will vary depending on the type of project and the data collected, but, in general, actual metered/measured equipment operating data should be used as much as possible.

All equations to be used in calculating energy savings should be included in the project's M&V plan. For example, for a project that decreases equipment electric demand but causes no change in operating hours, the stipulated savings calculations might appear as follows:

Equation 6.1:

$$\text{Demand Savings [kW]} = \text{kW}_{\text{Baseline}} - \text{kW}_{\text{Post-installation}}$$

Equation 6.2:

$$\text{Annual Energy Savings [kWh]} = (\text{kW}_{\text{Baseline}} - \text{kW}_{\text{Post-installation}}) * \text{Hours}_{\text{Stipulated}}$$

Where:

$\text{kW}_{\text{Baseline}}$ = Baseline equipment demand as measured by pre-installation short-term metering during the utility peak, summer coincident load period.

$\text{kW}_{\text{Post-installation}}$ = Post-installation equipment demand as measured by short-term metering during the utility peak, summer coincident load period.

$\text{Hours}_{\text{Stipulated}}$ = Annual operating hours determined using stipulated factor.

6.6 Project-Specific M&V Issues

When stipulated factors will be used to calculate energy savings, the M&V plan must address the following issues:

- How accurately stipulated factors will reflect actual energy savings.
- How well the stipulated factors are supported by other data sources, physical observations, or monitoring data.
- How appropriate the stipulated factors are to the equipment and operating conditions involved in the project.
- How the baseline energy consumption estimates will incorporate minimum state and federal energy efficiency standards or codes.